

Application No. 09/986,926  
Amendment dated August 8, 2003  
Reply to Office Action of May 8, 2003

PATENT

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

1. (Original) An apparatus for imaging radio frequency electromagnetic signals comprising:
  - an optical source operable to output an unmodulated optical signal;
  - an image sensor operable to receive the unmodulated optical signal and an incident radio frequency electromagnetic signal and to modulate the unmodulated optical signal with the received radio frequency electromagnetic signal so as to form a modulated optical signal;
  - a lens operable to receive the modulated optical signal and to focus the modulated optical signal; and
  - a photodetector operable to receive the focused modulated optical signal and output an electrical signal representing the focused modulated optical signal.
2. (Original) The apparatus of claim 1, wherein the optical source is a laser.
3. (Original) The apparatus of claim 1, wherein the image sensor comprises:
  - a plurality of cells, each cell comprising:
    - a first electro-optically active optical waveguide;
    - a first planar electrode substantially parallel to the first waveguide;
    - a second electro-optically active optical waveguide;
    - a second planar electrode substantially parallel to the second waveguide, the first and second planar electrodes being substantially adjacent and coplanar; and
    - a third planar electrode substantially parallel to the first and second planar electrodes and disposed such that the first waveguide lies between the first and third planar electrodes, and the second waveguide lies between the second and third planar electrodes.

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4. (Original) The apparatus of claim 3, wherein the optical source is coupled to a first end of each of the waveguides.

5. (Original) The apparatus of claim 4, further comprising:  
an output optical waveguide coupled to the second end of each of the first and second waveguides.

6. (Original) The apparatus of claim 5, further comprising:  
a coupler electrically connecting the first and third planar electrodes, whereby the first and third planar electrodes are kept at substantially the same electrical potential.

7. (Original) The apparatus of claim 6, further comprising:  
a polymer layer in which the waveguides are formed and to which the planar electrodes are attached.

8. (Original) The apparatus of claim 7, wherein the first planar electrode is arranged so that an incident radio frequency electromagnetic signal will impinge upon the first planar electrode.

9. (Original) The apparatus of claim 3, wherein the third planar electrode comprises a first portion and a second portion and is disposed such that the first waveguide lies between the first planar electrode and the first portion of the third planar electrode, and the second waveguide lies between the second planar electrode and the second portion of the third planar electrode.

10. (Original) The apparatus of claim 9, wherein the optical source is coupled to a first end of each of the waveguides.

11. (Original) The apparatus of claim 10, further comprising:  
an output optical waveguide coupled to the second end of each of the first and second waveguides.

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12. (Original) The apparatus of claim 11, further comprising:  
a couple electrically connecting the first planar electrode and the first and second portions of the third planar electrode, whereby the first planar electrode and the first and second portions of the third planar electrode are kept at substantially the same electrical potential.

13. (Original) The apparatus of claim 12, further comprising:  
a polymer layer in which the waveguides are formed and to which the planar electrodes are attached.

14. (Original) The apparatus of claim 13, wherein the first planar electrode is arranged so that an incident radio frequency electromagnetic signal will impinge upon the first planar electrode.

15. (Original) The apparatus of claim 1, wherein the photodetector is an array of photodiodes.

16.-17. (Cancelled)

18. (Currently Amended) ~~The system of claim 16,~~ An apparatus for imaging radio frequency electromagnetic signals comprising:

an imaging sensor operable to receive an incident radio frequency signal and output a corresponding electrical signal; and

a processor operable to receive the electrical signal and generate a signal representing an image of the received radio frequency signal;

wherein the imaging sensor comprises:

an optical source operable to output an unmodulated optical signal;

an image sensor operable to receive the unmodulated optical signal and an incident radio frequency electromagnetic signal and to modulate the unmodulated optical signal with the received radio frequency electromagnetic signal so as to form a modulated optical signal;

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a lens operable to receive the modulated optical signal and to focus the modulated optical signal; and

a photodetector operable to receive the focused modulated optical signal and output an electrical signal representing the focused modulated optical signal.

19. (Original) The apparatus of claim 18, wherein the optical source is a laser

20. (Original) The apparatus of claim 18, wherein the image sensor comprises:

a plurality of cells, each cell comprising:

a first electro-optically active optical waveguide;

a first planar electrode substantially parallel to the first waveguide;

a second electro-optically active optical waveguide;

a second planar electrode substantially parallel to the second waveguide, the first and second planar electrodes being substantially adjacent and coplanar; and

a third planar electrode substantially parallel to the first and second planar electrodes and disposed such that the first waveguide lies between the first and third planar electrodes, and the second waveguide lies between the second and third planar electrodes.

21. (Original) The apparatus of claim 20, wherein the optical source is coupled to a first end of each of the waveguides.

22. (Currently Amended) The apparatus of claim 21, further comprising:

an output optical waveguide coupled to the a second end of each of the first and second waveguides.

23. (Original) The apparatus of claim 22, further comprising:

a coupler electrically connecting the first and third planar electrodes, whereby the first and third planar electrodes are kept at substantially the same electrical potential.

24. (Original) The apparatus of claim 23, further comprising:

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a polymer layer in which the waveguides are formed and to which the planar electrodes are attached.

25. (Currently Amended) The apparatus of claim 24, wherein the first second planar electrode is arranged so that ~~an~~ the incident radio frequency electromagnetic signal will impinge upon the first second planar electrode.

26. (Original) The apparatus of claim 20, wherein the third planar electrode comprises a first portion and a second portion and is disposed such that the first waveguide lies between the first planar electrode and the first portion of the third planar electrode, and the second waveguide lies between the second planar electrode and the second portion of the third planar electrode.

27. (Original) The apparatus of claim 26, wherein the optical source is coupled to a first end of each of the waveguides.

28. (Currently Amended) The apparatus of claim 27, further comprising:  
an output optical waveguide coupled to ~~a~~ the second end of each of the first and second waveguides.

29. (Original) The apparatus of claim 28, further comprising:  
a coupler electrically connecting the first planar electrode and the first and second portions of the third planar electrode, whereby the first planar electrode and the first and second portions of the third planar electrode are kept at substantially the same electrical potential.

30. (Original) The apparatus of claim 29, further comprising:  
a polymer layer in which the waveguides are formed and to which the planar electrodes are attached.

31. (Currently Amended) The apparatus of claim 30, wherein the first second planar electrode is arranged so that ~~an~~ the incident radio frequency electromagnetic signal will impinge upon the first second planar electrode.

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32. (Original) The apparatus of claim 18, wherein the photodetector is an array of photodiodes.

33.-36. (Cancelled)

37. (Currently Amended) The system of claim 36, A system for imaging a target using imaging radio frequency electromagnetic signals comprising:  
an illuminator operable to radiate radio frequency electromagnetic signals so as to illuminate the target; and  
an imaging apparatus operable to receive radio frequency electromagnetic signals reflected from the target and to image the received radio frequency electromagnetic signals wherein the imaging apparatus comprises:  
an imaging sensor operable to receive an incident radio frequency signal and output a corresponding electrical signal;  
a processor operable to receive the electrical signal and generate a signal representing an image of the received radio frequency signal; and  
a display operable to display a signal representing the image of the received radio frequency signal;  
wherein the imaging sensor comprises:  
an optical source operable to output an unmodulated optical signal;  
an image sensor operable to receive the unmodulated optical signal and an incident radio frequency electromagnetic signal and to modulate the unmodulated optical signal with the received radio frequency electromagnetic signal so as to form a modulated optical signal,  
a lens operable to receive the modulated optical signal and to focus the modulated optical signal; and  
a photodetector operable to receive the focused modulated optical signal and output an electrical signal representing the focused modulated optical signal.

38. (Original) The apparatus of claim 37, wherein the optical source is a laser.

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39. (Original) The apparatus of claim 37, wherein the image sensor comprises:  
a plurality of cells, each cell comprising:  
a first electro-optically active optical waveguide;  
a first planar electrode substantially parallel to the first waveguide;  
a second electro-optically active optical waveguide;  
a second planar electrode substantially parallel to the second waveguide, the first and second planar electrodes being substantially adjacent and coplanar and  
a third planar electrode substantially parallel to the first and second planar electrodes and disposed such that the first waveguide lies between the first and third planar electrodes, and the second waveguide lies between the second and third planar electrodes.
40. (Original) The apparatus of claim 39, wherein the optical source is coupled to a first end of each of the waveguides.
41. (Currently Amended) The apparatus of claim 40, further comprising:  
an output optical waveguide coupled to the a second end of each of the first and second waveguides.
42. (Original) The apparatus of claim 41, further comprising:  
a coupler electrically connecting the first and third planar electrodes, whereby the first and third planar electrodes are kept at substantially the same electrical potential.
43. (Original) The apparatus of claim 42, further comprising:  
a polymer layer in which the waveguides are formed and to which the planar electrodes are attached.
44. (Currently Amended) The apparatus of claim 43 wherein the ~~first~~ second planar electrode is arranged so that an the incident radio frequency electromagnetic signal will impinge upon the ~~first~~ second planar electrode.

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45. (Original) The apparatus of claim 39, wherein the third planar electrode comprises a first portion and a second portion and is disposed such that the first waveguide lies between the first planar electrode and the first portion of the third planar electrode, and the second waveguide lies between the second planar electrode and the second portion of the third planar electrode.

46. (Original) The apparatus of claim 45, wherein the optical source is coupled to a first end of each of the waveguides.

47. (Currently Amended) The apparatus of claim 46, further comprising:  
an output optical waveguide coupled to the a second end of each of the first and second waveguides.

48. (Original) The apparatus of claim 47, further comprising:  
a couple electrically connecting the first planar electrode and the first and second portions of the third planar electrode, whereby the first planar electrode and the first and second portions of the third planar electrode are kept at substantially the same electrical potential.

49. (Original) The apparatus of claim 48, further comprising:  
a polymer layer in which the waveguides are formed and to which the planar electrodes are attached.

50. (Currently Amended) The apparatus of claim 49, wherein the first second planar electrode is arranged so that an the incident radio frequency electromagnetic signal will impinge upon the first second planar electrode.

51. (Cancelled)

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REMARKS/ARGUMENTS

Claims 1-15, 18-32, and 37-50 are pending in this application. Claims 16, 17, 33, 36 and 51 were cancelled. Claims 19, 22, 25, 28, 31, 37, 41, 44, 47, and 50 were amended. Support for the amended claims can be found in the specification. No new matter has been added.

Applicant notes with appreciation that claims 1-15 were allowed.

Claims 18-32 and 37-50 were objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Accordingly, Applicant has rewritten claims 18 and 37 in independent form with minor corrections. Hence claims 18 and 37 should be allowed. Claims 19-32 depend from claim 18 and claims 38-50 depend from claim 37; therefore claims 19-32 and 38-50 should also be allowed. Applicant has amended claims 22, 25, 28, 31, 41, 44, 47 and 50 to correct certain typographical errors and better claim the invention. In short, claims 18-32 and 37-50 are in condition for allowance.

Claims 16, 17, 33-36 and 51 were rejected. To expedite the prosecution of the above identified application, Applicant has canceled these claims without prejudice in any manner.

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CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 650-326-2400.

Respectfully submitted,



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